



REHEAT COOLING STEAM SYSTEM

General Revision, May 1982

GENERAL

This unit is equipped with steam cooling of the first reheat stage. The purpose of the cooling is to reduce the first reheat stage wheel temperature in order to increase the expected life of the rotor material.

Cooling is accomplished by extracting steam at a suitable temperature from the HP section and introducing it into the center of the double flow reheat section. This cooling steam mixes with high temperature steam leaking into the upstream wheelspace from the discharge of the first reheat stage nozzle, resulting in the cooling of the first reheat stage wheel.

An overspeed potential exists because the reheat section of the boiler can blow down through the cooling line to the turbine reheat section. The combined valves are bypassed by the cooling steam line. Overspeed protection is provided by a flow restricting orifice. This orifice is sized to minimize cooling steam flow contribution to overspeed on a generator load rejection. The flow restricting orifice should never be replaced with an orifice of larger diameter without approval of Large Steam Turbine.

Thermocouples are provided to continuously monitor the temperature in this region. The temperature settings mentioned in this instruction are given on the Steam Cooling Diagram (see T-G Instruction Book).

The Steam Cooling Diagram also shows the schematic arrangement of the reheat cooling steam system. There are two valves. The first is an air operated valve (S11). This valve is interlocked with the heating steam feed valve (HSFV) so that it is open anytime the HSFV is closed and closed any time the HSFV is open. This valve will, therefore, be open any time the unit is in operation. The second valve is the reheat cooling steam valve (SRCV). This is used to manually adjust the cooling steam flow rate if additional cooling becomes necessary. The cooling steam flow rate may have to be varied over the life of the unit due to deterioration of the turbine steam

path caused by such factors as solid particle erosion, deposits, packing rubs, etc. The reheat cooling steam valve (SRCV) is set during the initial startup period of the unit and following major maintenance to achieve the desired temperature at the upstream side of each first reheat stage.

The S11 valve is supplied with an open and a closed limit switch. The open limit switch is wired to function a light on the EHC panel. When the turbine is carrying load, this panel light will show that the cooling steam valve (S11) is open. The closed switch (AOVCS-S11) is an extra switch available for customer use.

On some units a flow measuring orifice has been provided. This orifice never restricts steam flow and would only be used to take special flow measurements. Normal field operating checks do not require such measurements, so most units are not equipped with a flow measuring orifice.

INITIAL SETTING OF SYSTEM

During initial installation of the reheat cooling steam piping, the flow restricting orifice is to be inspected to make sure it is properly located in the cooling steam line. Failure to install the flow restricting orifice would result in higher turbine overspeeds on load rejections.

The reheat cooling steam valve (SRCV) should be set during the initial startup period of the unit and after any major turbine maintenance outage. The following procedure should be followed to set the valve. The reheat cooling steam valve (SRCV) should be opened fully prior to the initial rolling of the unit. After the unit has reached full load and rated steam conditions, the reheat cooling steam valve (SRCV) should be partially closed such that the first reheat stage upstream wheelspace temperature is within 10°F of the normal operating value. The setting of the reheat cooling steam valve (SRCV) should now be such that, at any operating condition of the turbine,

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

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the first reheat stage upstream wheelspace temperature does not exceed the alarm temperature. The reheat cooling steam valve (SRCV) should be locked at that position. If the turbine end and generator end first reheat stage upstream wheelspace temperatures are different, the higher temperature should be used to set the reheat cooling steam valve (SRCV). Operation at temperatures higher than the alarm temperature will tend to reduce the overall life of the rotor. Operation at temperatures lower than the normal operating temperature will result in an unnecessary heat rate penalty.

TEMPERATURE LIMITATIONS

The temperature in the region of the first reheat stage wheel is continually recorded on the Turbine Supervisory Instrumentation. To assist the operator in determining what action to take if the alarm temperature is reached, the following schedule is given:

1. If the alarm point is reached, the reheat cooling steam valve (SRCV) should be unlocked and opened further to restore the temperature back to its normal operating value. The valve should then be locked at its new setting.
2. If, after the alarm point is reached, the reheat cooling steam valve (SRCV) cannot be further adjusted to bring the temperature down to below the alarm point, then an outage should be scheduled to investigate the cause of the increased temperature. The General Electric Company should be notified.
3. Operation at temperatures between the "RUN ONE MONTH" and "SHUTDOWN" temperature should not be undertaken without consultation with General Electric Company.
4. If the temperature exceeds the "SHUTDOWN" temperature, the reading should be verified with

the other two elements of the thermocouple. If they confirm the "SHUTDOWN" temperature has been reached, the unit should be SHUT-DOWN the following weekend to investigate the cause of the high wheelspace temperature or the reheat temperature reduced by attemptation to bring the wheelspace temperature below the "SHUTDOWN" temperature.

5. Any step changes in these temperatures (30°F or more) without any obvious change in either the setting of the reheat cooling steam valve (SRCV) or reheat temperature should be reported to General Electric Company.

MAINTENANCE

1. Once each week all elements of both thermocouples should be monitored to check if they are still operational and whether there is any evidence of trends or sudden changes in the first reheat stage upstream wheelspace temperature that might be an indication of a future problem.
2. At all scheduled or other outages of this unit, the thermocouple elements should be inspected and checked according to GEK-72227, "Thermocouples, Installation and Maintenance."
3. The flow restricting orifice should be checked periodically for possible erosion. This can be done during shutdowns. Flanges are provided in the piping for this purpose.
4. The S11 valve is an air operated valve. This valve is designed to fail open on loss of air to its actuator. If service is required, the valve nameplate should be consulted for the valve body type and actuator type. The service instructions can be found in the Steam Seal portion of the Instruction Book.

